DOCUMENT RESUME

ED 244 665 JC 840 251

AUTHOR Greenhill, Craig J.
TITLE Technological Education in the Year 2000: Rethinking the Official Future.
PUB DATE 31 May 84
NOTE 10p.; Paper presented at the Joint Conference of the Canadian Vocational Association and the Association of Canadian Community Colleges (Vancouver, British Columbia, May 28-31, 1984).
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Curriculum Development; *Educational Objectives; *Futures (of Society); *Student Educational Objectives; *Technical Education; *Technological Advancement

ABSTRACT

Alternative views of technological education in the year 2000 are presented in this paper. First, a discussion of futuristic thinking highlights arguments that the world's progress is non-linear, that major changes are made in quantum leaps and at unpredictable times, and that the "official future" (i.e., a vision shared by members of an industry, organization, or a society that serves as the basis for decisions and initiatives) tends to ignore the surprises and non-linear events that are likely to occur. Next, assumptions about the role of technology in industrial societies are presented. Then, the following six questions concerning technological education in the year 2000 are answered on the basis of the "official future" and of opposing alternatives: (1) What is the primary impact of technological change on the curriculum? (2) What is the educator's primary view of the educational enterprise? (3) Will many non-traditional competitors be present in the educational marketplace? (4) What is the primary impact of technological change on students' life style? (5) How may the primary learning style of the student-client be characterized? (6) What is the learner's conception of the payoff to his/her primary life style made by education? Finally, a matrix summarizing the range of the alternative futures is presented. (HB)

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BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY
3700 WILLINGDON AVENUE, BURNABY, BRITISH COLUMBIA, CANADA V5G 3H2 AREA CODE (604) 434-5734

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TECHNOLOGICAL EDUCATION IN THE YEAR 2000:

RETHINKING THE OFFICIAL FUTURE

by

Craig J. Greenhill

Director, Institute Planning

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

1984:05:31

Presented at the Joint Conference of the Canadian Vocational Association and the Association of Canadian Community Colleges
Vancouver, British Columbia

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TECHNOLOGICAL EDUCATION IN THE YEAR 2000

Introduction

When I first was asked about doing a session at this conference, there was some predictable discussion of alternatives and the role that they might play in the future. A little later on I will lay out some systematic alternatives for our consideration, however, it is first necessary to make some preliminary comments on the role of such futuristic thinking.

In the relatively recent past, we have identified for ourselves a line of enquiry and a management orientation which emphasizes the future in more systematic ways than was the case a century ago. We all know the general findings about pace of innovation and technological change which has escalated rapidly in the past fifty years compared with any other segment in history.

In response to that apparent pace of change, we have gone to some pains to try to define the future that we all wish to inhabit and work systematically to build it. You may recall the "Choice of Futures - Future of Choices" imagery in the Worth Commission on Education in Alberta about ten years ago.

The single most frustrating lesson we have learned from our ventures into forecasting, futurism and detailed planning is that ours is a non-linear world. Indeed, rather than a smooth or even stuttering progression of events along a line of development, we have learned that the world makes major changes in quantum leaps at largely unpredictable times.

In hindsight, we have gone back and identified the undetected events which, if we had been paying more attention at the time, would have tipped us off to an impending change. However, we still are poor at seeing those early warning signals before a major change is upon us.

The point of those observations is to highlight the paradox of our limited ability to predict or forecast a future, while we maintain a commitment to developing and improving which is tied to an explicit or implicit vision of a desirable future.

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A concept of a desirable future which is shared across an industry or an organization, or even across a society, becomes a very comfortable compass for acting and working together. Such a common vision has been called the "Official Future" and it does provide a sense of confidence and rationale for many decisions and initiatives that we take.

The profound problem with the Official Future is that, by definition, it ignores the surprises and non linear events which are likely to befall us. Around 1970, for example, the Official Future of Canada and the United States included cheap and abundant petroleum products. That assumption collapsed a decade ago and we are still feeling the indirect repurcussions. The problem with reliance on the "Official Future" is like that of ignoring the future: we get sloppy in our management.

My approach in these comments, is, then, to pose some straightforward questions about our own "official future" that may sensitize us towards those early warning signals which could herald fundamental change in our professional or personal lives.

Technology and Society

The year 1984 has, for many in North America and Britain, rekindled an interest in the threats to society from technology as cast by George Orwell. That very level of interest signifies a general concern with technology and a general agreement that technological change has accelerated and has profound potential for social change, often seen negatively as controlling or downgrading.

A more optimistic approach is being taken in France where scholars and politicians hope to encourage both a broader public appreciation of science and technology and, more important, an integration with the literary and artistic culture for human progress. In their case, the work of Denis Diderot in the 18th century is being used to catalyze and focus discussion and reflection on the challenges and goals that comtemporary science faces.

Whether one sees technology as a negative or positive influence, there is no doubt that all visions of the future include continued development of technology and wide spread application across society.

To this point, I have used the term technology in a broad generic way to describe the application of science to practical problems of the real world. I have not distinguished between a sculptor who uses heli-arc welding in his creations from a computer scientist whose research with galium arsenide holds promise of a quantum leap improvement in the speed of micro circuit performance. Both use sophisticated equipment and applied scientific inventions. As individuals, they are likely to have substantially different personal values, life styles and work habits. To the extent that both are users and inventors of technology they are both likely candidates for technological education or re-education even though their career dictionary classifications differ.

Technological Education in the Year 2000 - Six Questions

There is no shortage of ideas and assertions about what the substance and organization of education for the applied sciences and technologies should be like in the future. Our purpose here is to identify a limited number of questions which cut through the existing alternatives and let us assess the implications.

To pose the questions, I propose to use the model of the ancient Roman god Janus. I propose to look two ways at once i.e. to look within and examine the educational enterprise itself and to look without to examine the client or learner. In each case, three questions are to be asked and opposing responses posed to identify the limits of the analysis.

Curriculum

Looking within education, the underlying assumption of technological change and development causes us to ask "what is the primary impact of technological change on curriculum?"

Probably the most common feature of the official future is that increased technology and application of high technology involving micro-electronics will require much more technical education since technology will drive our lives and it will be essential to be highly skilled.

On the other hand, we have many examples of the development of technology reducing the skills required by those who use the inventions. In this case, the impact of technological change on curriculum would be to make programs more general since technology frees human creativity for the

humanitites and triggers a new renaissance while expert systems and artificial intelligence performs the chores of the economy.

View of the Enterprise

The second question of the educational system is "What is the educator's primary view of the enterprise?"

On the one hand, educators can see education as primarily teaching which emphasizes the craft of teachers and the activities or attributes of teachers. This view of the enterprise implies differentiation of roles among teachers, assistants, administrators and other players who are linked through organizational structures and role definitions and respond through a system of expectations and controls.

Alternatively, the primary view of the enterprise can be that of enabling learning by students. A focus on learning emphasizes the objectives which students are to achieve or the products they are to produce. The professional decisions of educators then focus on the learning experiences and materials which can most effectively be brought together to enable that learning. With information technology available, the possibilities for individualization and automation of learning support come to the fore with emphasis on the process of learning and, where necessary, the equipment and technology for student use which would opimize the learning experience.

Competition

The third major question which we should ask of the educational enterprise is, "Will many non-traditional competitors be present?"

On the one hand, we may anticipate few non traditional competitors which means that technological education will fundamentally be continued by post-secondary institutions, although the range of post-secondary institutions may be more limited than at present.

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In contrast, we may well seee a substantial number of non-traditional competitors in the technological education market place. In fact the emergence of new institutions such as the Wang Institute, and expansion of others such as Northrup University are examples of private institutions based in industrial or business enterprises which are now accredited.

Student Life Style

With respect to the student or client, we may ask "What is the primary impact of technological change on the student life style?"

On the one hand, if the classic industrial model is applied, the impact of technological change is to continue the primary focus of life as employment or work, although the substance of work and employment may be one of a wide range of alternatives.

An opposing view is that the impact of technological change may be such that expert systems and automation take over the care and feeding of the economic engine of society so that individuals are able to pursue their individual avocations without reference to employment for wages as the principal focus of their lives.

Learning Style

The second question of students is "How may the primary learning style of the student client be characterized?"

First, using a pre-industrial society model, the learning style becomes blended with home training, apprenticeship, and continued development evolving throughout a person's lifetime and fully intertwined with style of life.

On the other hand, the primary learning style of the student client may be quantized or packaged in specific blocks of time. In this case, the learning activities are distinct and separate from others in the person's life at least with respect to time and probably with respect to location or geography.

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Payoff

One of the most interesting questions to ask of the student is "What is the learner's conception of the payoff to his or her primary lifestyle made by education?"

A low payoff for student lifestyle resulting from education revolves around issues of relevance, currency and opportunity. Low payoff for education has in recent times been associated with lack of social mobility or unemployment in particular fields.

High payoff for primary lifestyle infers either that the skill-set learned or the knowledge and attitudes acquired are consistent with the issues or opportunities available to the individual.

Sixty-four Futures

Three questions on two dimensions, each question with a binary response provides an eight by eight matrix of possibilities, i.e. sixty-four futures. This section identifies the official future among that set and raises some questions for educators and policy makers.

The eight by eight matrix shown in Table 1 summarizes the six questions posed and the range of alternative answers. Within that matrix, the "Offical Future" can be characterized as:

1. Impact of technology on education is to make curriculum more technical
2. Educators primary view of enterprise is teaching
3. Education business has few non traditional competitors
4. Impact of technology is to make student lifestyle one of work
5. Primary learning style of the student is quantized
6. Learners' perception of payoff of education to lifestyle is high

Of course, simple binary choices obscure the important mid ground between the alternatives for each question, however, the important lesson from the past several years is to find the weak element in the "Official Future". Matters of degree are secondary in contrast with the surprising collapse of fundamental assumptions which are completely overriden by events.

TABLE 1

The primary impact of technological change on the student is to make his or her primary LIFESTYLE one of: →	WORK				AVOCATION			
The primary LEARNING style of the student client may be characterized as: →	CONTIN-UOUS		QUAN-TIZED		CONTIN-UOUS		QUAN-TIZED	
The learner's perception of the PAYOFF to primary lifestyle made by education is: →	HI	LO	HI	LO	HI	LO	HI	LO
Primary impact of techno-logical change on education is to make CURRICULUM:	Educators primary view of ENTERPRISE is as:	Education business does (not) have non-traditional COMPETITORS:							
MORE technical since technol'y drives our lives	TEACHING .craft -roles -org'n -control	YES							
		NO							
	LEARNING -process -equipment -materials -automation	YES							
		NO							
LESS technical since technol'y enables new renaissance	TEACHING	YES							
		NO							
	LEARNING	YES							
		NO							

In contrast to the "Official Future", an alternative which would be surprising and perhaps threatening to many involved in formal technological education would include dominance of the learned industry by non traditional competitors who feed the general curriculum interests of learners who, in turn, see virtually no payoff of learning for their avocational lifestyle. At this juncture, such an alternative appears unlikely, however it is the unexpected which gives us the most difficulty.

Conclusion

People with problems that can be solved through technological education and individuals with the ability to provide that education will find ways of coming together. Our conventional institutions perhaps find it difficult to change as rapidly as we would like, and policy, regulation and financial alternatives in the education arena may help or hinder in various ways. Those of us who work to expedite a match between educational requirements and educational opportunities should not be unaware of the limitations of our implicit view of the "Official Future". It is inconceivable that technology will not develop, although we may not be sure of the particular lines it will take; therefore, streamlining and reform of technological education must be a priority for us all.

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8118 Math-Sciences Building
Los Angeles, California 90024